

NCDOT ITS & Signals Unit

Signal Design Tips

Backup Protection

June 2006 Revised

Dynamic Backup Control:

A number of methods have been used to avoid the "yellow trap" problem. A simple omit has been used to prevent backing up from concurrent through phases to a fully protected left turn movement opposing a permissive left turn movement. In this case the driver has a couple of options: wait for a gap in traffic she has determined is sufficient to safely execute the turn, or allow the signal to transition through the side street - due to actual demand on the side street - then service the protected left. In time this operation was tweaked to not only omit the "offending" phase but also false call the side street phase.

Dummy Phase:

Back in the day there was yet another option - the "dummy" all-red phase. This operation allowed the signal to transition from concurrent through phases to the "dummy" all-red phase prior to servicing the fully protected left turn movement. As mentioned above this assumes the left turn in question is opposed by a permissive left turn movement.

Backup Protect with Red Revert:

The Econolite Oasis software includes functionality that mimics the "dummy" all-red operation. The Backup Protect feature forces the selected phase to revert to red to avoid realizing a "yellow trap" situation.

For example, enabling backup protect operation for phase 6 allows the controller to clear from phase 2+6 to phase 1+6 by progressing through an all red display, i.e., phase 6 is forced to revert to red. How long phase 6 displays the red is a function of the red revert timing, which is added to the timing chart. To avoid the appearance of improper operation this interval is typically at least 5 seconds in duration. See page 2 for examples.

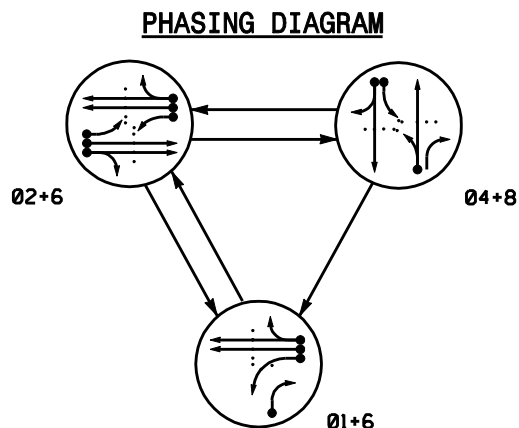
This type of operation is typically more efficient than any of the other options that involve terminating all phases to avoid "the trap." This feature is only available with 2070L controllers with Oasis software. It cannot be used with Cary or Burlington's signal system software.

For more information contact Pam Alexander or Todd Joyce at 919-733-3915.

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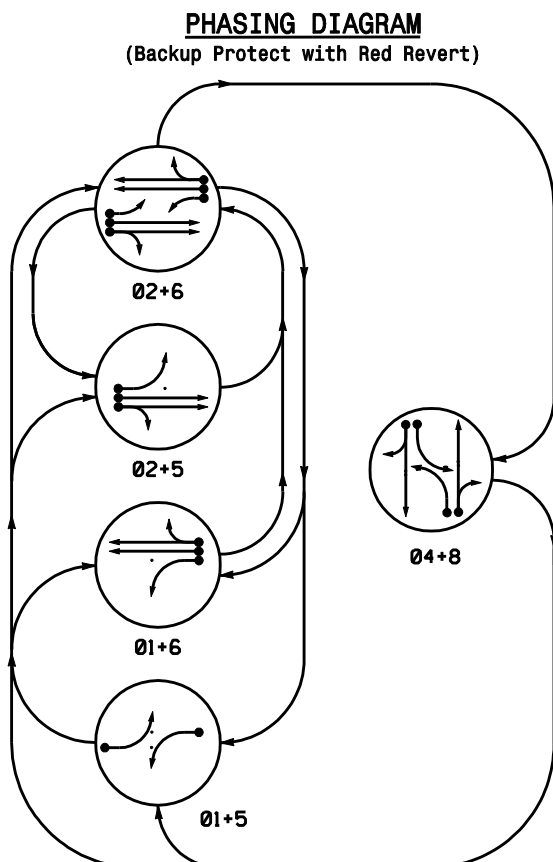
Backup Protect with Red Revert – 3-Phase Example



Note:
Enable backup protect for phase 6
to allow the controller to clear from
phase 2+6 to phase 1+6 by progressing
through all red display. (Replaces phase
omit note and force to side street note.)

2070L TIMING CHART					
FEATURE	PHASE				
	1	2	4	6	8
Min Green 1 *	7	12	7	12	7
Extension 1 *	1.0	6.0	1.0	6.0	1.0
Max Green 1 *	20	90	30	90	30
Yellow Clearance	4.0	4.7	4.0	4.7	4.0
Red Clearance	2.0	1.5	3.0	1.5	3.0
Red Revert	2.0	2.0	2.0	5.0	2.0
Walk 1 *	-	-	-	-	-
Don't Walk 1	-	-	-	-	-
Seconds Per Actuation *	-	1.5	-	1.5	-
Max Variable Initial *	-	34	-	34	-
Time Before Reduction *	-	15	-	15	-
Time To Reduction *	-	30	-	30	-
Minimum Gap	-	3.0	-	3.0	-
Recall Mode	-	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	-	YELLOW	-	YELLOW	-
Dual Entry	-	-	ON	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON

Backup Protect with Red Revert – 5-Phase Example



2070L TIMING CHART						
FEATURE	PHASE					
	1	2	4	5	6	8
Min Green 1 *	7	14	7	7	14	7
Extension 1 *	1.0	6.0	1.0	1.0	6.0	1.0
Max Green 1 *	20	90	25	20	90	25
Yellow Clearance	4.0	5.7	4.0	4.0	5.7	4.0
Red Clearance	3.0	1.5	3.0	3.0	1.5	3.0
Red Revert	2.0	5.0	2.0	2.0	5.0	2.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	1.5	-	-	1.5	-
Max Variable Initial *	-	46	-	-	46	-
Time Before Reduction *	-	15	-	-	15	-
Time To Reduction *	-	45	-	-	45	-
Minimum Gap	-	3.4	-	-	3.4	-
Recall Mode	-	MIN RECALL	-	-	MIN RECALL	-
Vehicle Call Memory	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON

Note:
Enable backup protect for phase 2+6 to allow the controller
to clear from phase 2+6 to phase 1+6 or 2+5 by progressing
through all red display. (Replaces phase omit note and force
to side street note.)